ABSTRACT OF THE DISCLOSURE

An optical inspection apparatus and method is provided that utilizes both linear and nonlinear optical phenomena to detect defects. Embodiments include irradiating a portion of the surface of an article, such as a semiconductor device, with a light beam, such as a scanning laser at an incident wavelength. The light emanating from the irradiated surface portion is then separated into light at the incident wavelength and light at one or more predetermined non-incident wavelengths, as by a diffraction grating, prism or filters. The light at the incident and nonincident wavelengths is sent to separate detectors, such as photomultipliers (PMT), which respectively convert the detected linear optical phenomena (representing, e.g., surface topography) into an electrical signal, and the detected nonlinear optical phenomena, such as fluorescence, Raman scattering and/or second harmonic generation, into electrical signals representing, e.g., chemical composition and material interfaces. The signal from each detector is sent to a processor, which generates a defect map based on the information gleaned from both the linear and nonlinear optical phenomena.